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Case Report

Aesthetic finger prosthesis

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ABSTRACT

Finger and partial finger amputations are commonly due to traumatic injuries. Rehabilitation of such patients with disabilities is a challenging task. The success of the prosthesis depends on the precision of planning the prosthesis, making the impression, carving the model and choosing the material that best suits the concerned circumstances. This clinical report portrays a method to fabricate silicone rubber prosthesis for a patient who has a partial finger loss caused due to trauma.

1. Introduction

It is rightly said, "we never realize how important some things are until we lose it." Moreover, the realization is hard-hitting when that something turns out to be a body part, limb, or a digit. Finger and partial finger amputations are some of the most frequently encountered forms of partial hand losses resulting in significant functional deficiencies, in addition to immediate loss of grasp, strength and security.[1] Also the absence of a finger may cause marked psychological trauma to the individual. Most common causes of finger absence are amputations due to traumatic injuries, disease, congenital absences or malformations. Amputation of finger for such patient help to restore esthetics, function & cosmetic appearance, but also answer their overall psychological well-being.

"Amputation", derived from the Latin word "amputare" (to excise, to cut out) has been defined as the "removal of part or all of a body part enclosed by skin.'[2] Before the management of an amputee, the functional requirements of the individual and management options must be discussed with the patient. A complete hand examination should be performed, estimating the amount of injury to the fingertip, angles and levels of amputation, loss of tissue, involvement of nail, involvement of other fingers, neurovascular involvement, and function of the hand. After assessing the fingertip injury, a treatment plan should be formulated. It is seen that prosthetic rehabilitation can be satisfactory in patients who have at least 1.5 cm of residual stump.[3]

Replacement of a missing individual finger by fabricating an artificial finger is challenging, requires great skill in terms of artistic and technical expertise. Various methods like titanium implants, osteo integration abutment, silicone elastomers are in use for replacing missing finger. Passing through various materials, the acceptance rate has been much higher when an individually sculpted custom restoration using silicone elastomer.[4] Most of the prostheses are made from room temperature vulcanizing silicones (RTV silicones). The advantages of RTV silicones include chemical inertness, flexibility and elasticity. The prosthesis

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can be retained either by mechanical methods or by the use of adhesives. Implant retained prostheses have proven to be satisfactory, but they are economically not feasible.[5]

Success of the prosthesis depends on the precision in planning, making the impression, carving the model and choosing the material that best suits the circumstances. Finger prostheses are challenging due to the stability and retention required.[6] We obtained fairly good retention added by the use of the retentive finger ring due to lack of adequate surface area of the stump and were quite successful.

Here is a case report which describes a conventional method of fabrication of finger prosthesis, with a new approach or amputee finger modification for better retention and comfort.

2. Case Report

A 45-year-old female patient reported to the Department of Prosthodontics, Crown and Bridge of Rungta College of Dental Sciences and Research, Bhilai with the complaint of a partially missing finger. History revealed that the patient lost her two digits 10 years ago in a traumatic injury caused during the road accident. The amputated stump was well-healed. A complete examination of the hand revealed a residual stump terminating in the middle phalangeal region.

The area around the residual stump was without any sign of inflammation (Figure 1). A treatment plan was formulated to replace the finger with silicone prosthesis. The advantages and limitations of replacement of the finger were explained to the patient.

Fig. 1: Preoperative photograph

An irreversible hydrocolloid impression material was chosen for making impressions. The patient's hand was lubricated with a thin layer of petrolatum jelly to prevent the hydrocolloid impression material from adhering to the skin and hair of surgical site and the tissue surface. Impressions of defected hand were made by using plastic containers of sufficient length and diameter to confine the impressions. The patient was asked to dip his hand into the container without touching the sides or the bottom of the container. The material was allowed to set and the hand were removed gently after the material was set (Figure 2). The impressions were poured in the dental stone and the cast was retrieved (Figure 3). Then another impression is made only of affected finger and cast was retrieved after pouring with dental stone. This act as a die for fabrication of metal ring which used as retentive aid. Then the was pattern was made on this die and casting was done to get a metal ring of appropriate dimension (Figures 4 and 5).

Fig. 2: Impression after removal of hand

An impression of the donor contralateral ring finger was made using the irreversible hydrocolloid impression material and was poured with modelling wax. This used as a wax pattern for fabrication of final prosthesis (Figure 6). The wax pattern was retrieved and was modified and accessed on the complete hand model to gain a complete harmony with the rest of the fingers. Pattern was further surface characterised to mimic the soft tissue wrinkles, skin folds, etc using sculpting tools. Then the wax pattern along with metal ring was tried on the patient's finger stump and checked for the measurements on both the dorsal and ventral aspects (Figure 7).

The most critical step was to match the colour of the prosthesis to the patient's skin colour. By observing the basic skin colour, the intrinsic were added to the silicone material to obtain the natural shade (Figure 8). Two-piece moulds were used for flasking(Figure 9). RTV silicone material was mixed with intrinsic colours and was packed into the mould. Curing was done for 24 hours at room temperature. Prosthesis was finished and polished.

Fig. 3: Fabrication of cast

Fig. 5: Metal ring for retention

Fig. 4: Wax pattern for metal ring

Fig. 6: Wax pattern

Extrinsic stains were used for final characterisation and colour matching with the adjacent fingers.

3. Discussion

Loss of any finger affects esthetics and functionality, greatly impacting dexterous individuals. Most cases involving distal phalanx amputations can be restored to near normal functionality using appropriate prosthesis. Allen's classification is commonly used to describe the level of amputation for fingertip amputations. Type 1 injuries are those involving the pulp only. Type 2 injuries consist of injury to the pulp and nail bed. Type 3 injuries include distal phalangeal fracture with associated pulp and nail loss. Type 4 injuries involve the lunula, distal phalanx, pulp and nail loss.[7] The primary purpose of prosthesis is to allow the patient to pass unnoticed, and concealment of prosthesis usage has been found to be an effective coping strategy.[8]

The artificial digit is made of a RTV silicone material. A significant advantage of using this technique is the exact duplication of the anatomical and the fine surface details of the digits. This allows the surface characteristics of the prosthesis to be closely matched to that of the remaining digits of the hand.

The additional functional benefits of silicone prostheses include desensitization and protection of the painful

Fig. 7: Try in

Fig. 8: Colour matching

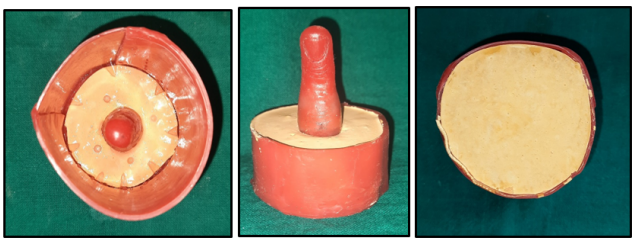

Fig. 9: Processing of wax pattern in two-piece mould

Fig. 10: Final prosthesis

hypersensitive tissue at the amputation site by constant gentle pressure exerted over the affected area. It has also been speculated that silicone gel improves the hydration of the stratum, making the scar tissue more pliable, and comfortable.[9] Colour matching was the most critical aspect of lifelikeness. It should not be affected by climatic variations, heat resistant and must not be stained by ordinary materials. Prosthesis must be cleaned easily and should not irritate the skin.

This article describes the rehabilitation of a finger with prosthesis, which is simple to construct, aesthetic, retentive and easy to maintain. By restoring the natural appearance to the hand, a prosthesis eliminates the trauma caused by constant reminder of the handicap and, thus, offers true psychological therapy.

4. Conclusion

It is the God-given right of every human to appear human. Rehabilitating the defects of the hand or limbs with an artificial prosthesis can be rewarding and satisfying for a maxillofacial prosthodontist. Adequate knowledge of material, proper handling of material and excellent skill can result in successful prosthesis. Loss of a finger has been found to affect the person psychologically. In such situations restoring aesthetics with sufficient retention becomes the prime concern. Thus, a custom-made finger prosthesis using silicone polymers is aesthetically acceptable, partially restores some degree of functionality and is comfortable for patients. Once a part of a body is amputated, it is difficult to get the same result even after plastic surgery. Although providing the best to our patients should be our aim.

5. Source of Funding

None.

6. Conflict of Interest

The authors declare no conflict of interest.

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